www.seasonalhurricanepredictions.org

Barcelona Supercomputing Center
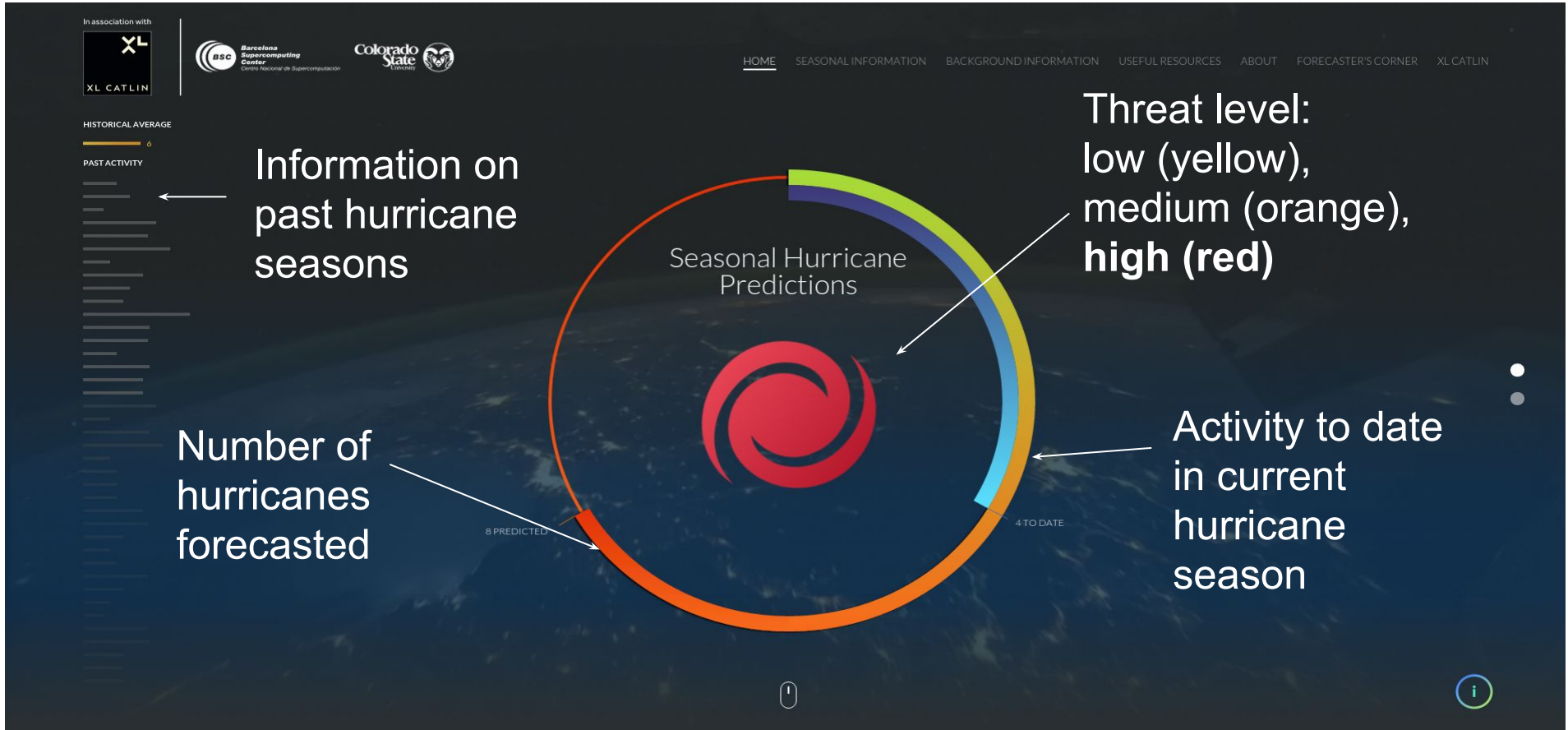### Centro Nacional de Supercomputación

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Introduction

Seasonal hurricane forecasts are produced ahead of each hurricane season by a range of different groups, from national meteorological services to academic groups to private weather forecasting companies. While these forecasts are generally made freely available by the groups who produce them (usually on their organization's website), there was, until recently, no website centralizing these predictions. This made gathering that information time consuming (if one was aware of all of the given forecasts in the first place) and made ensemble operations and comparisons between different forecast agencies difficult. In that context, the Barcelona Supercomputing Center and Colorado State University have collaborated to produce a platform offering the most up-to-date view of upcoming Atlantic hurricane activity.

www.seasonalhurricanepredictions.org aggregates all freely available seasonal forecasts of Atlantic hurricane activity ahead of the hurricane season and displays them on a user-friendly platform. The site offers ensemble forecasts of named storms, hurricane and major hurricane numbers as well as accumulated cyclone energy (ACE) as soon as the first predictions are produced in March and is updated throughout the season as more forecasts become available. The website also supplies supporting information on the forecasts themselves and their performance at the end of the season, but also more broadly on seasonal forecasting and hurricane activity.

Information on past hurricane seasons

Threat level: low (yellow), medium (orange), high (red)

Number of hurricanes forecasted

Activity to date in current hurricane season

What forecasts are included?

Universities

1. Coastal Carolina University
2. Colorado State University
3. North Carolina State University
4. Penn State University
5. Seoul National University
6. University of Arizona
7. University of Colorado
8. University of Missouri
9. University of Technology Sydney - CSIRO

Governmental Agencies

1. NOAA
2. Insmet
3. Mexican National Meteorological Service
4. Met Office
5. NMME

Private entities

1. AccuWeather
2. CFAN
3. DTN
4. Radiant Solutions
5. Reask
6. StormGeo
7. Tropical Storm Risk
8. WeatherBell Analytics
9. The Weather Company
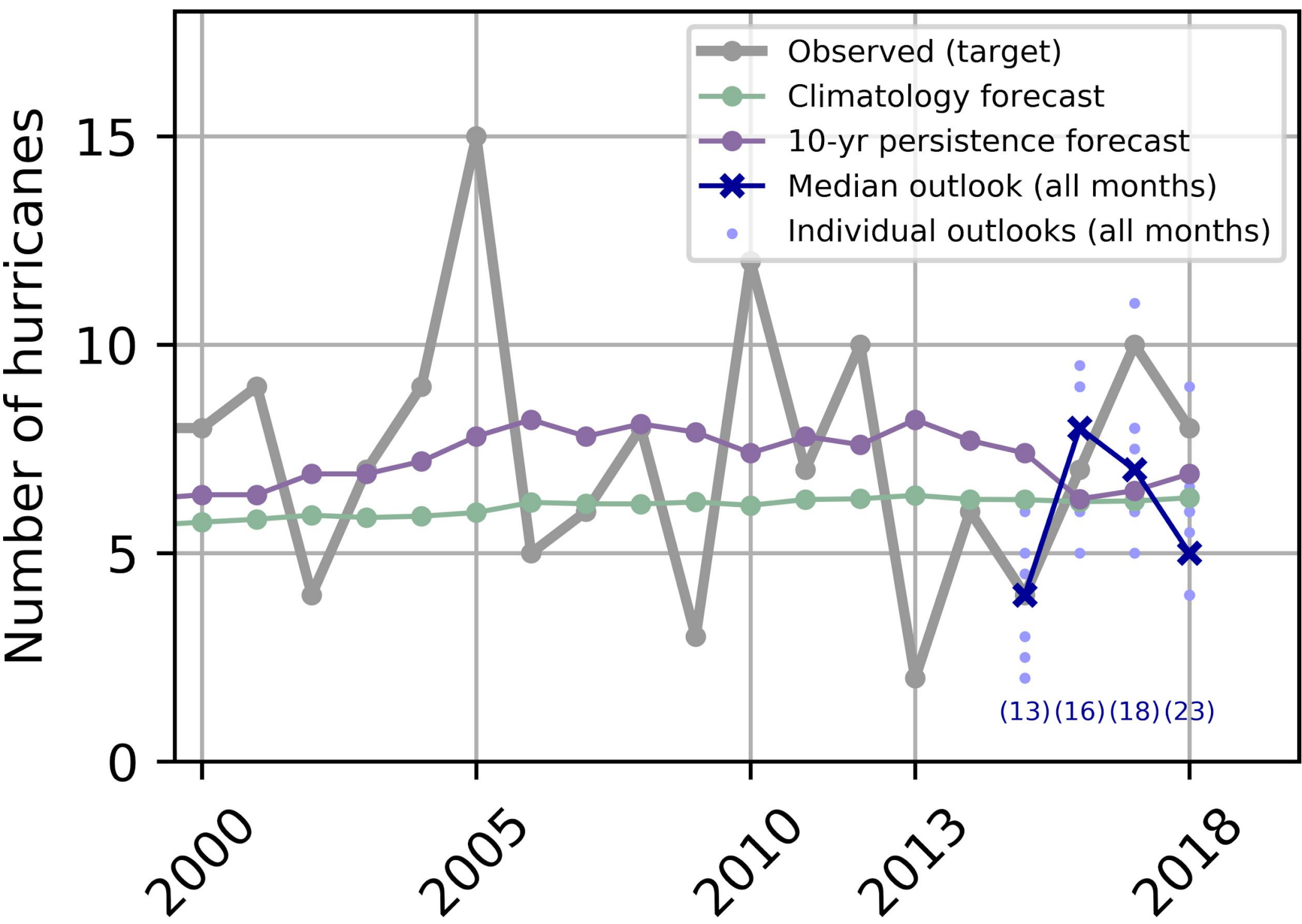10. WeatherWorks
11. Weather Tiger
12. 268Weather

What else is provided?

- Background information
- All of the data in .csv format
- Links to useful resources
- Short summary in pdf format

Average ensemble forecast

The observed number of hurricanes for each season is shown in gray. The light blue dots are all of the latest individual hurricane outlooks collected since 2015 (one dot per group). The dark blue line is the median of those outlooks. The green and purple lines are two benchmark forecasts: the climatology forecast is defined as the average of all hurricane counts from 1969 to the current year minus one (green), and the 10-yr persistence forecasts is defined as the average of all hurricane counts from the 10 preceding years (purple). The numbers along the x-axis indicate the number of forecasts that have been submitted for a given year for that particular variable. From Caron et al. (2019) Bull. Amer. Meteor. Soc. In press.

This poster can be downloaded at
https://earth.bsc.es/wiki/doku.php?id=library:external:posters
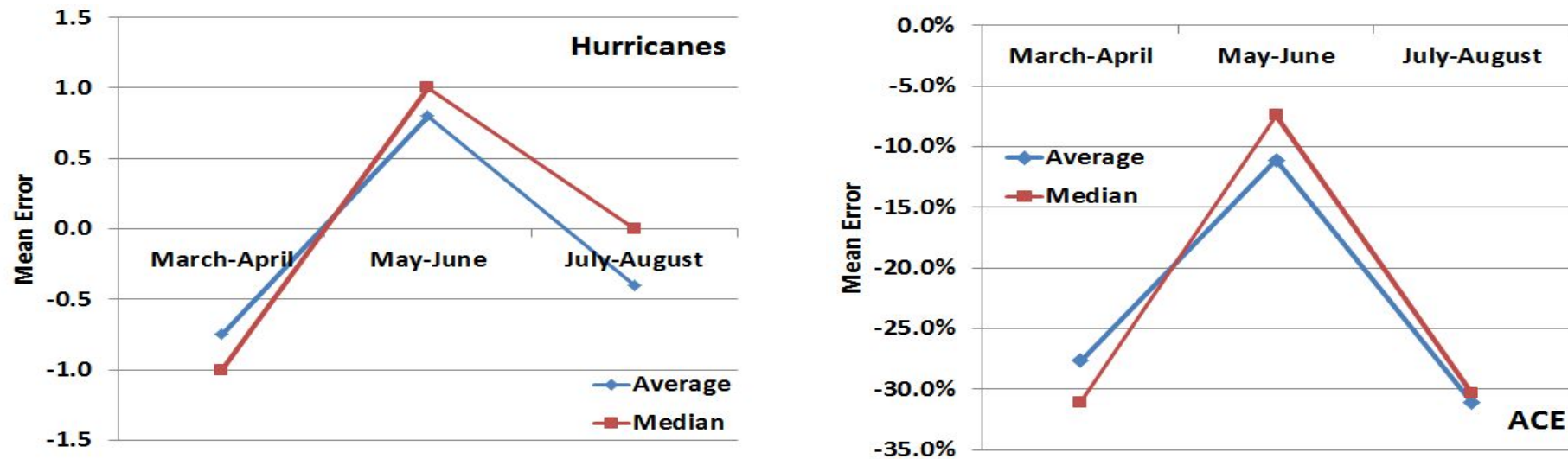Corresponding author: louis-philippe.caron@bsc.es

2016 Season

The 2016 Atlantic hurricane season was generally fairly quiet until late September, when long-lived major hurricane Matthew formed. Matthew was responsible for over 40% of all ACE generated during this season. The 2016 Atlantic hurricane season was characterized by cool neutral El Niño-Southern Oscillation (ENSO) conditions. Contrary to the previous two years, this season was characterized by below-average vertical wind shear when averaged from August-October across most of the tropical Atlantic. Slightly above-average vertical wind shear prevailed over the Caribbean. While the tropical Atlantic was somewhat warmer-than-normal, the mid-levels of the atmosphere were quite dry during this hurricane season.

The season was characterized by above-average hurricane activity with a total of 15 named storms, 7 hurricanes, 4 major hurricanes and an Accumulated Cyclone Energy of 141. The ensemble mean forecast called for 15 named storms (--), 8 hurricanes (+1), 3 major hurricanes (-1) and an ACE of 108 (-23%). For comparison, the 1981-2010 median values of these quantities are 12 named storms, 6.5 hurricanes, 2 major hurricanes and an ACE of 92.

The aggregate forecast was relatively successful, accurately predicting the total number of storms, but slightly overestimating the number of hurricanes while at the same time underestimating the number of major hurricanes and the ACE. It should be noted however that Otto was considered a major hurricanes for just 6 hours. The average forecast outperformed a forecast based on climatology.

	Average forecast	Observed	Difference
Named storms	15	15	-
Hurricanes	8	7	+1
Major hurricanes	3	4	-1
ACE	108	141	-23%

The average values predicted by all groups issuing forecasts in March/April were 14 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 107. These numbers increased in May/June to 14 named storms, 8 hurricanes, 3 major hurricanes and an ACE of 117. Predictions issued in July/August were generally lower than in the previous period, with 15 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 97. The number of forecasts for each period was 10 for March-April, 10 for May-June and 6 for July-August.
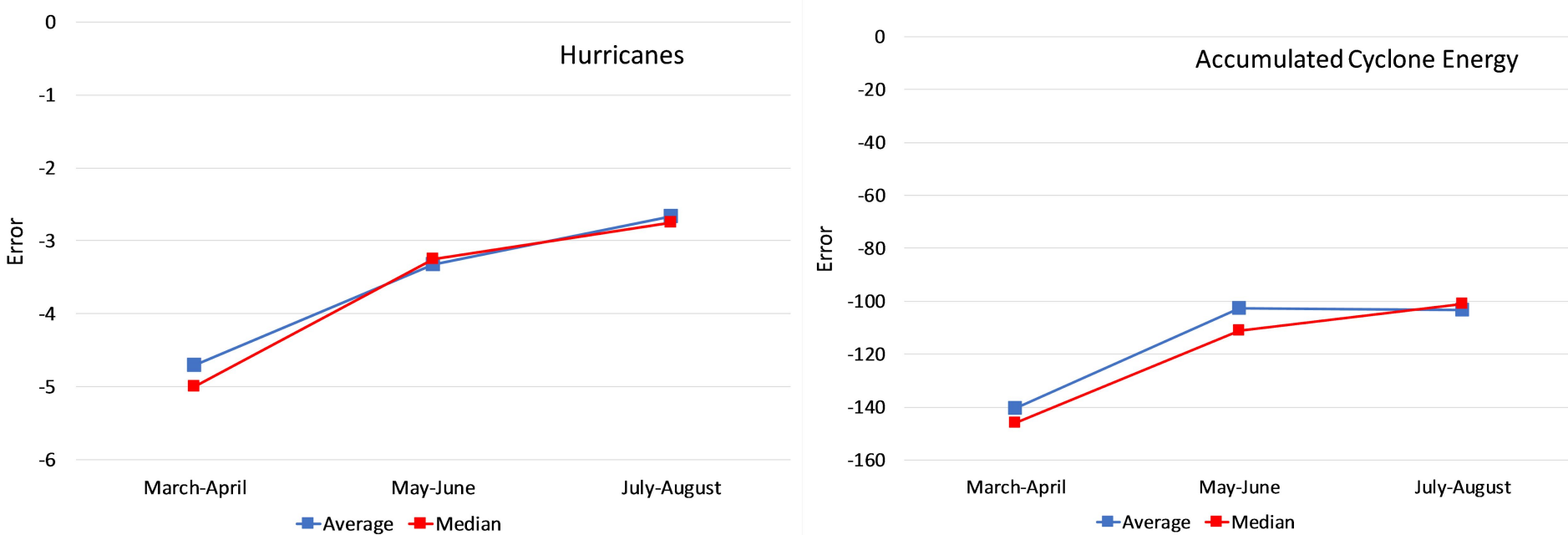

2017 Season

The season was extremely active with a total of 17 named storms, 10 hurricanes, 6 major hurricanes and an Accumulated Cyclone Energy (ACE) of 226. The 1981-2010 median values of these quantities are 12 named storms, 6.5 hurricanes, 2 major hurricanes and an ACE of 92. The hurricane season was dominated by September, which generated the most ACE by any Atlantic calendar month on record. All other months had near-normal activity. The 2017 Atlantic hurricane season was generally characterized by neutral El Niño-Southern Oscillation (ENSO) conditions. During the record-breaking September of 2017, vertical wind shear levels were well below normal, providing conditions more conducive for hurricane formation and intensification. Sea surface temperatures in the tropical Atlantic were also much warmer than normal. The continental United States was devastated by two Category 4 hurricane landfalls: Harvey and Irma. Irma and Maria brought incredible levels of death and destruction across points of the Caribbean and other parts of the tropical Atlantic.

	Average forecast	Observed	Difference
Named storms	14	17	-3
Hurricanes	7	10	-3
Major hurricanes	3	6	-3
ACE	128	226	-43%

In general, Atlantic seasonal hurricane forecasts called for a slightly below-average Atlantic hurricane season in March/April, with agencies generally increasing their forecasts in May/June and July/August. This increase in predicted storm activity was due to several factors including the lack of development of predicted El Niño conditions as well as anomalous warming in the tropical Atlantic. The average values predicted by all groups issuing forecasts in March/April were 12 named storms, 5 hurricanes, 2 major hurricanes and an ACE of 86. These numbers increased in May/June to 13 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 123. Predictions issued in July/August called for 15 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 123.
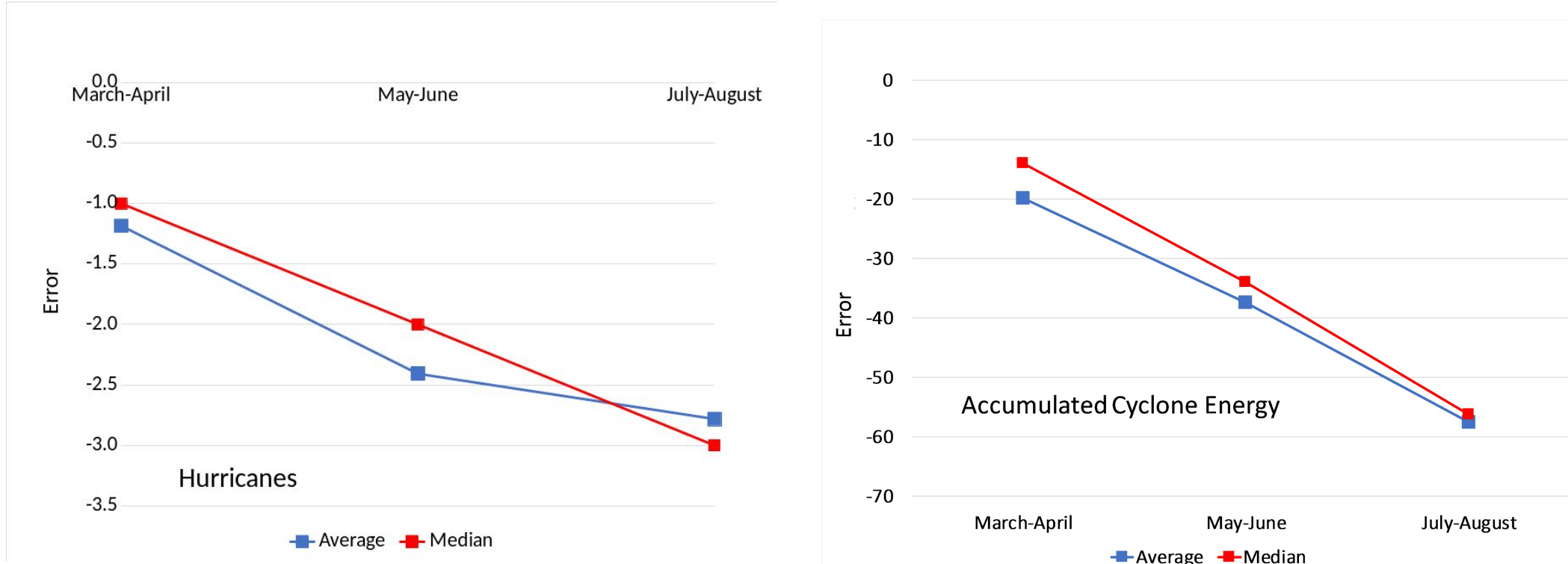

2018 Season

The season ended up slightly above normal with a total of 15 named storms, 8 hurricanes, 2 major hurricanes and an Accumulated Cyclone Energy (ACE) of 133. The 2018 Atlantic hurricane season was extremely quiet in August and quite active in both September and October. The season will be remembered for two hurricanes. Hurricane Florence made landfall near Wrightsville Beach, North Carolina as a Category 1 hurricane and brought record-setting rainfall to the Carolinas as it slowed to a crawl and meandered across the southeastern United States for several days. Hurricane Michael made landfall near Mexico Beach, Florida as a Category 5 hurricane and brought extreme wind and surge damage to portions of the Florida Panhandle, with severe wind impacts also being felt inland in southern Georgia.

	Average forecast	Observed	Difference
Named storms	12	15	-3
Hurricanes	6	8	-2
Major hurricanes	2.5	2	+0.5
ACE	87	129	-33%

In general, Atlantic seasonal hurricane forecasts called for a slightly above-average Atlantic hurricane season in March/April, with agencies generally decreasing their forecasts in May/June and July/August. Unlike most seasons where the skill of the seasonal forecasts increases as the peak of the season approaches, this season's early forecasts were more skillful than updates issued during July/August. This decrease in predicted storm activity was primarily due to anomalous cooling that took place in the tropical Atlantic. Despite anomalously cool tropical Atlantic conditions during the hurricane season and stronger than normal shear in the Caribbean, the Atlantic hurricane season was slightly above-normal, likely due to favorable conditions in the eastern tropical Atlantic and in the subtropical Atlantic. Warm neutral ENSO conditions prevailed during the season.

The average values predicted by all groups issuing forecasts in March/April were 14 named storms, 7 hurricanes, 3 major hurricanes and an ACE of 109. These numbers decreased in May/June to 12 named storms, 6 hurricanes, 2 major hurricanes and an ACE of 92. The average prediction issued in July/August called for 11 named storms, 5 hurricanes, 2 major hurricanes and an ACE of 71.

2019 Season

24 groups have provided their seasonal predictions to the website in 2019. Most forecasts submitted over the past two months are predicting near- to slightly above-average hurricane activity, with the average of all seasonal forecasts issued since March calling for a total of seven hurricanes, which is slightly above the long-term average of six hurricanes. The average number of hurricanes predicted in the Atlantic for March/April seasonal forecasts was 6, for May/June seasonal forecasts was 7 and for July/August seasonal forecasts was 7. These numbers include Andrea and Barry, which formed in the Atlantic in May and July, respectively.

The National Oceanic and Atmospheric Administration (NOAA) has officially declared El Niño over, however, there is still warmer than normal water across most of the central tropical Pacific. The continuation of this warm water has been cited by several groups who kept their forecasts relatively constant from June to August, despite the typical increase in Atlantic hurricane activity expected when El Niño dissipates. Other groups anticipate the lack of El Niño to be a considerable enhancing factor for the amount of hurricane activity expected this season.

Sea surface temperatures averaged across the tropical Atlantic are currently near their long-term averages, with sea surface temperatures in the subtropical Atlantic much warmer than normal. However, cold anomalies persist in the eastern tropical Atlantic, which is typically not associated with active seasons. Vertical wind shear has generally averaged somewhat stronger than normal across most of the Caribbean through early September, and sea level pressure anomalies have also been higher than normal.

	Average Forecast (range)	Climatology (1981-2010 median)	Number of forecasts
Named storms	13 (10-16)	12	23
Hurricanes	7 (5-8)	6	21
Major hurricanes	3 (2-4)	2	18
ACE	117 (65-167)	92	13

Acknowledgments